

Observations and Quantification of Counter-rotating Mesovortex Couplets within the 8 May 2009 Southern Missouri Derecho

Angela D. Lese

National Weather Service, Louisville, Kentucky

and

Steven M. Martinaitis

National Weather Service, Warning Decision Training Branch

There has been ample research on quasi-linear convective systems (QLCS's), especially since the Bow Echo and MCV Experiment (BAMEX) in 2003. Observations during BAMEX and from additional subsequent research have shed light upon leading-line circulations called mesovortices. Through numerous studies, these phenomena have been found to be responsible for intense straight-line wind damage and occasional tornadoes within QLCS's. This was especially the case for the 8 May 2009 derecho that swept across southern Missouri into western Kentucky, where 28 tornadoes were reported within a six hour period that morning, most occurring in the county warning area (CWA) of the National Weather Service (NWS) Weather Forecast Office (WFO) in Springfield, MO (SGF). Over thirty mesovortices can be found in the Springfield, MO WSR-88D Doppler Radar (KSGF) reflectivity and velocity data alone, and display very interesting characteristics throughout their lifetime.

Although the behavior of the system and resultant mesovortices were quite interesting, this case study, in particular, will be focused on two cyclonic mesovortices (one tornadic and one non-tornadic), where each have an associated anti-cyclonic mesovortex signature, as observed by the KSGF base velocity data. Idealized simulations have shown that cyclonic and anti-cyclonic mesovortex couplets were possible in bowing line segments. Only one other counter-rotating mesovortex couplet has been observed within a QLCS structure, via airborne Doppler-derived velocities; however, this is the first documented case where counter-rotating mesovortex couplets have been identified in WSR-88D Doppler radar data. These mesovortex couplets will be examined in detail, and the implications of this finding on operational warning techniques will be discussed.